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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/672,521	09/26/2003	Toru Takayama	0553-0193.01	1175

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EXAMINER

LEE, CHEUNG

ART UNIT PAPER NUMBER

2812

DATE MAILED: 07/20/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/672,521

Applicant(s)

TAKAYAMA ET AL.

Examiner

Cheung Lee

Art Unit

2812

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 May 2006.
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 26,27,29-32,34-37,39-42 and 44-49 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 26,27,29-32,34-37,39-42 and 44-49 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Notice to Applicant

1. Applicants' Amendment and Response to the Office Action mailed on February 3, 2006 has been entered and made of record.

Claim Objections

2. Claims 41-42, 44-45 and 49 are objected to because of the following informalities:

In claim 41, line 5, delete "to form a wiring", and in line 6, substitute "the wiring" with --the gate electrode--.

Claims 42, 44-45 and 49 depend from claim 41, so they are objected for the same reason.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation

Art Unit: 2812

under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 26-27, 30-31 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuda (US Pat. 6078071) in view of Oikawa et al. (US Pat. 4619695; hereinafter "Oikawa") and Shindo et al. (US Pat. 5667665; hereinafter "Shindo").

4. Referring to figures 5E-6E and related text, Matsuda discloses [Re claim 26] a method of manufacturing a wiring in a semiconductor device comprising the steps of: forming a film including tungsten 128 or 210 by sputtering method (col. 10, lines 55-60; col. 11, lines 25-30); and patterning the film (see figs. 5F and 6B). However, Matsuda fails to disclose expressly wherein using simple argon gas as a sputtering gas; and wherein an amount of sodium contained within the wiring is 0.3 ppm or less.

Shindo discloses sputtering process in an argon atmosphere (col. 1, lines 25-29). So, the argon gas is inherently presented to create argon atmosphere.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use argon gas as sputtering gas, as taught by Shindo, because it would have been to obtain a non-reactive atmosphere while sputtering.

Oikawa discloses high-purity tungsten metal (col. 8, lines 6-15; see abstract), and a high-purity metal target with sodium less than 10 ppb (0.01 ppm) (col. 6, lines 20-30;

Art Unit: 2812

see Table 1). Oikawa also discloses that the purity of the resulting film is governed by the purity of the target (col. 2, lines 5-12). So, when the film is deposited even with variation caused by sputtering process at least there is still an overlapping range of sodium concentration between the wiring of Oikawa with the claimed invention.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use high-purity metal obtained by Oikawa's method, because it would have been to obtain wiring of good performance characteristics (see Oikawa's Summary).

5. [Re claim 27] Oikawa also discloses wherein the sputtering method uses a tungsten target having a purity of 4N or more (col. 6, lines 20-30; col. 8, lines 6-15).

6. Matsuda discloses [Re claim 30] wherein the sputtering method is performed at a gas from 1.0 Pa to 3.0 Pa (col. 8, lines 27-36).

7. [Re claim 31] The combined teaching of Matsuda, Oikawa and Shindo discloses substantially the limitations of claim 31, as shown above. Matsuda also discloses the patterning to form a gate electrode 110 (col. 10, lines 10-13).

8. Matsuda discloses [Re claim 35] wherein the sputtering method is performed at a gas from 1.0 Pa to 3.0 Pa (col. 8, lines 27-36).

9. Claims 29-30, 32 and 34-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuda in view of Oikawa and Shindo, as applied above, and further in view of Brodsky et al. (US Pat. 6245668; hereinafter "Brodsky").

Art Unit: 2812

10. [Re claims 29-30] The combined teaching of Matsuda, Oikawa and Shindo discloses substantially the limitations of claims 29-30, as shown above. But it fails to disclose expressly wherein the sputtering method is performed at a substrate of 300°C or lower.

Brodsky discloses a sputtered tungsten film formation at a temperature less than 420°C (col. 2, lines 41-51 and col. 5, lines 26-36). In the case where claimed ranges “overlap or lie inside ranges disclosed by the prior art” a prima facie case of obviousness exists. *In re Wertheim*, 541 F. 2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F. 2d 1575, 16 USPQ 2d 1934 (Fed. Cir. 1990).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use Brodsky’s sputtering conditions, because it would have been to obtain high-purity tungsten layer at a low temperature ensuring the reliability of the device made.

11. [Re claims 32 and 34-35] The combined teaching of Matsuda, Oikawa and Shindo discloses substantially the limitations of claims 32 and 34-35, as shown above. But it fails to disclose expressly the sputtering conditions and the purity of the tungsten target. However the missing limitations are well know in the art because Brodsky discloses these features (col. 2, lines 41-54; col. 4, lines 41-44; col. 5, lines 26-36). The motivation stated in claims 29-30 also applies.

Art Unit: 2812

12. Claims 36 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuda in view of Oikawa and Shindo, as applied above, and further in view of Kobeda et al. (US Pat. 5208170; hereinafter "Kobeda").

[Re claims 36 and 41] The combined teaching of Matsuda, Oikawa and Shindo discloses substantially the limitations of claims 36 and 41, as shown above. But it fails to disclose expressly forming a semiconductor film over the wiring.

However, the missing limitation is well known in the art because Kobeda discloses this feature (see abstract).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to form a semiconductor film over the wiring, as taught by Kobeda, because it would have been to obtain an etch stop layer in subsequent forming steps using dry etching.

13. Claims 37, 39-40, 42 and 44-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuda in view of Oikawa, Shindo and Kobeda, as applied above, and further in view of Brodsky.

All the features of claims 37, 39-40, 42 and 44-45 have been previously shown to be obvious to an ordinary artisan. The motivation stated in claims 29-30 also applies.

14. Claims 46-49 are rejected under 35 U.S.C. 103(a) as being unpatentable over the cited references, as applied above, and further in view of Mizuno (US Pat. 5840366; hereinafter "Mizuno").

The combined teaching of the applied references discloses substantially the limitations of claims 46-49, as shown above. But it fails to disclose expressly the claimed stress level of the tungsten conductor (wiring or gate electrode).

However, the missing limitation is well known in the art because Mizuno discloses the forming of W conductor having a stress level of 4.1×10^9 dyn/cm² (see Example 2).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to form a W conductor with Mizuno's stress level, because it would have been to obtain better surface morphology.

Response to Arguments

15. Applicants' arguments with regard to the rejection under 35 U.S.C. 103(a) have been fully considered, but they are not deemed to be persuasive for at least the following reasons.

16. Applicants argue that the cited references do not disclose a simple argon gas as a sputtering gas. However, Shindo discloses sputtering process in an argon atmosphere (col. 1, lines 25-29), as shown in the rejection above. The argon gas is inherently presented to create argon atmosphere. So, the claimed limitation is met.

17. Applicants argue that in Oikawa is discussing a molybdenum target, not tungsten as in claim 26. However, Oikawa discloses that the high-melting metal other than molybdenum can be tungsten (col. 8, lines 6-15; see abstract). So, if a tungsten metal

is formed, then a tungsten target will be described in the same manner as molybdenum's with similar characteristics.

18. Applicants argue that there is nothing in this section in Oikawa that discloses the amount of sodium in the wiring or how the target purity is related on a quantitative basis with the amount of material in the wiring. However, Oikawa specifically discloses that the purity of the resulting film is governed by the purity of the target (col. 2, lines 5-12), as shown in the rejection above. So, when the film is deposited even with variation caused by sputtering process at least there is still an overlapping range of sodium concentration between the wiring of Oikawa with the claimed invention. Besides, Oikawa discloses analyses of impurities in the film, which is formed with the target disclosed in Example (col. 6, lines 8-50), including uranium contents and sodium contents (col. 6, line 50-col. 7, line 9). So, this shows the target purity is related with the film purity on a quantitative basis.

19. Applicants also argue that Shindo is directed to a film formed using a cobalt target, not a film including tungsten, as in the claimed invention. However, the examiner uses Shindo reference to show the usage of argon gas, not to show tungsten film formation.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cheung Lee whose telephone number is 571-272-5977. The examiner can normally be reached on Monday through Friday from 8:30AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Lebentritt can be reached on 571-272-1873. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2812

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Cheung Lee

July 14, 2006



MICHAEL LEBENTRITT
SUPERVISORY PATENT EXAMINER